

# THE ROCK MASS RATING SYSTEM (GEOMECHANICS CLASSIFICATION OF ROCK MASSES)

## A. CLASSIFICATION PARAMETERS AND THEIR RATINGS

Parameter			Range of Values						
1	Strength of intact rock mineral	Point-load strength index (MPa)	> 10	4 - 10	2 - 4	1 - 2	For this low range, uniaxial compressive test is preferred		
		Uniaxial compressive strength (MPa)	> 250	100 - 250	50 - 100	25 - 50	5 - 25	1 - 5	< 1
	Rating		15	12	7	4	2	1	0
2	Drill core quality RQD (%)		90 - 100	75 - 90	50 - 75	25 - 50	< 25		
	Rating		20	17	13	8	3		
3	Spacing of discontinuities		> 2 m	0.6 - 2 m	200 - 600 mm	60 - 200 mm	< 60 mm		
	Rating		20	15	10	8	5		
4	Condition of discontinuities		Very rough surfaces Not continuous No separation Unweathered wall rock	Slightly rough surfaces Separation < 1 mm Slightly weathered walls	Slightly rough surfaces Separation < 1 mm Highly weathered walls	Slickensided surfaces or Gouge < 5 mm thick or Separation 1 - 5 mm Continuous	Soft gouge > 5 mm thick or Separation > 5 mm Continuous		
	Rating		30	25	20	10	0		
5	Groundwater	Inflow per 10 m tunnel length (L/min)	None	< 10	10 - 25	25 - 125	> 125		
		Ratio $\frac{\text{Joint water pressure}}{\text{Major principal stress}}$	0	< 0.1	0.1 - 0.2	0.2 - 0.5	> 0.5		
	General conditions		Completely dry	Damp	Wet	Dripping	Flowing		
	Rating		15	10	7	4	0		

## B. RATING ADJUSTMENT FOR DISCONTINUITY ORIENTATIONS

Strike and dip orientations of Discontinuities		Very Favorable	Favorable	Fair	Unfavorable	Very Unfavorable
Ratings	Tunnels and mines	0	-2	-5	-10	-12
	Foundations	0	-2	-7	-15	-25
	Slopes	0	-5	-25	-50	-60

## C. ROCK MASS CLASSES DETERMINED FROM TOTAL RATINGS

Rating	100 ← 81	80 ← 61	60 ← 41	40 ← 21	< 20
Class no.	I	II	III	IV	V
Description	Very good rock	Good rock	Fair rock	Poor rock	Very poor rock

## D. MEANING OF ROCK MASS CLASSES

Class no.	I	II	III	IV	V
Average stand-up time	20 yr for 15-m span	1 yr for 10-m span	1 wk for 5-m span	10 h for 2.5-m span	30 min for 1-m span
Cohesion of the rock mass (kPa)	> 400	300 - 400	200 - 300	100 - 200	< 100
Friction angle of the rock mass (deg)	> 45	35 - 45	25 - 35	15 - 25	< 15

Assessment of joint orientation favourability upon stability of dam foundations

Dip 0° - 10°	Dip 10° - 30°		Dip 30° - 60°	Dip 60° - 90°
	Dip direction			
	Upstream	Downstream		
Very favourable	Unfavourable	Fair	Favourable	Very favourable

Note:

This table is based on experience and on consideration of stress distributions in foundation rock masses as well as on an assumption that in a dam structure both the arch and the gravity effects are present.

The initial *in-situ* state of stress is not considered here as in dam foundations *in-situ* stresses are mainly important when considering grouting, drainage curtains and the excavation sequence of the foundations. For this last aspect recent evidence shows that high horizontal stresses may be expected in near-surface rock masses.